

PATENT ABSTRACTS OF JAPAN

(11)Publication number : 08-101397

(43)Date of publication of application : 16.04.1996

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(51)Int.Cl. G02F 1/1345
G02F 1/136

(21)Application number : 06-261375

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(22)Date of filing : 30.09.1994

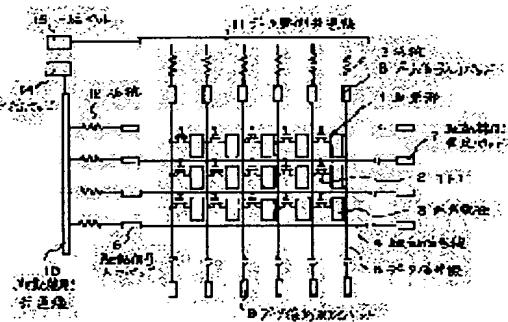
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(54) THIN FILM TRANSISTOR LIQUID CRYSTAL DISPLAY DEVICE AND ITS MANUFACTURE

(57)Abstract:

PURPOSE: To attain electrical inspection of individual pixel part in a thin film transistor liquid crystal display device and to find a fault of the pixel part.

CONSTITUTION: Plural pieces of drive signal lines 4 and data signal lines 5 are connected respectively in a matrix state for many pieces of pixel parts 1 incorporating a thin film transistor 2 and a pixel electrode 3, and a drive line side common line 10 and a data line side common line 11 are connected to respective signal lines respectively, and electrostatic charge is prevented, and resistors 12, 13 are inserted between respective signal lines and respective common lines respectively, and an electrical connection state between respective signal lines and respective common lines is held, and on the other hand, cross talk of applied potential between respective signal lines is suppressed, and the electrical inspection of individual pixel part is attained.



LEGAL STATUS

[Date of request for examination] 30.09.1994

[Date of sending the examiner's decision of rejection] 06.05.1997

[Kind of final disposal of application other than the examiner's decision of rejection or application converted registration]

[Date of final disposal for application]

[Patent number] 2715936

[Date of registration] 07.11.1997

[Number of appeal against examiner's decision of rejection] 09-09430

[Date of requesting appeal against examiner's decision of rejection] 05.06.1997

[Date of extinction of right]

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CLAIMS

[Claim(s)]

[Claim 1] Many pixel sections containing a thin film transistor and a pixel electrode are arranged in the shape of a matrix. The connection formation of an actuation signal line and the data signal line is changed into a matrix condition to each pixel section. And it sets to the thin film transistor mold liquid crystal display which carried out electrical connection of two or more actuation signal lines to the drive wire side highway, respectively, and carried out electrical connection of two or more data signal lines to the data-line side highway, respectively. The thin film transistor mold liquid crystal display characterized by inserting resistance, respectively between said each actuation signal line and a drive wire side highway and between said each data signal line and a data-line side highway.

[Claim 2] The thin film transistor mold liquid crystal display of claim 1 which a driving signal input pad is formed in two or more actuation signal lines, respectively, and a data signal input pad is formed in two or more data signal lines, respectively, and comes to insert resistance, respectively between this driving signal input pad and a drive wire side highway and between a data signal input pad and a data-line side highway.

[Claim 3] Resistance is the thin film transistor mold liquid crystal display of claims 1 or 2 which it comes to form at some pixel ingredients which form a pixel electrode.

[Claim 4] Manufacture of the thin film transistor mold liquid crystal display arranged in the shape of a matrix is faced many pixel sections containing a thin film transistor and a pixel electrode. The process which forms the flow section which connects a driving signal input pad, a drive wire side highway, and this driving signal input pad and a drive wire side highway with this actuation signal line at one at the same time it forms the gate electrode and actuation signal line of a thin film transistor, The process which forms an island between said driving signal input pad and a drive wire side highway in said a part of semi-conductor layer at the same time it forms the semi-conductor layer used as the channel of said thin film transistor, At the same time it forms the source drain electrode and data signal line of said thin film transistor The process which the connection section which connects a drive wire side highway with said driving signal input pad in said island, respectively is formed [process], and a hole is simultaneously established [process] in said flow section, and makes the flow section intercept, The process which forms said island into high resistance by **** at the same time it forms a channel for the semi-conductor layer of said thin film transistor by ****, The manufacture approach of the thin film transistor mold liquid crystal display characterized by including the process which forms resistance with said pixel electrode material between said driving signal input pad and a drive wire side highway at the same time it forms a pixel electrode.

[Claim 5] The process which forms an island in said a part of semi-conductor layer between the data signal input pad formed at degree process, and a data-line side highway at the same time it forms the semi-conductor layer of a thin film transistor, At the same time it forms the source drain electrode and data signal line of said thin film transistor The process which forms in this data signal line and one a data signal input pad, a data-line side highway, and the connection section that connects a data-line side highway with said data signal input pad in said island, respectively, The process which forms said island into high resistance by **** at the same time it forms a channel for the semi-conductor layer

of said thin film transistor by *****, The manufacture approach of the thin film transistor mold liquid crystal display of claim 4 including the process which forms resistance with said pixel electrode material between said data signal input pad and a data-line side highway at the same time it forms a pixel electrode.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Industrial Application] While this invention prevents the electrostatic discharge especially in TFT about the liquid crystal display (it is hereafter called LCD for short) which used the thin film transistor (it is hereafter called TFT for short), it relates to LCD which enabled inspection of TFT after manufacture, and its manufacture approach.

[0002]

[Description of the Prior Art] The TFT mold LCD has arranged many TFT(s) in the shape of a matrix, connected the actuation signal line to two or more line writing directions at each gate of TFT, and has connected the data signal line to a drain in two or more directions of a train. And TFT in a crossing will drive by choosing these actuation signal lines and data signal lines, respectively, and the pixel of this part will drive. For this reason, each actuation signal line and a data signal line will be constituted by the condition of having become independent, respectively. However, in order for there to be a possibility that gate dielectric film may be destroyed by static electricity since TFT is constituted on the other hand as an MOS transistor, and to prevent this, it is desirable to make common connection of these lines and to ground [in / at least / the production process of LCD] them so that static electricity may not be charged on each actuation signal line and a data signal line.

[0003] The pixel section 1 which drawing 4 is the conventional TFT mold LCD which took such measures, and contains TFT2 and the pixel electrode 3 is arranged in the shape of [in every direction] a matrix, the actuation signal line 4 is connected to two or more line writing directions at each gate of TFT2, and the data signal line 5 is connected to the drain in two or more directions of a train. And the driving signal input pad 6 is formed in one edge of the actuation signal line 4, respectively, and each driving signal input pad 6 is further connected to the drive wire side highway 10 collectively. Similarly, the data signal input pad 8 is formed in one edge of the data signal line 5, and each data signal input pad 8 is connected to the data-line side highway 11. In addition, the package pads 14 and 15 are formed in said drive wire side highway 10 and the data-line side highway 11, respectively, and it is made to fix to predetermined potential. Moreover, the drive wire side measurement pad 7 is formed in the other-end section of each of said actuation signal line 4, and the data-line side measurement pad 9 is similarly formed in the other-end section of each of said data signal line 5.

[0004] At LCD of this configuration, by grounding the drive wire side highway 10 and the data-line side highway 11 through the package pads 14 and 15, respectively at the time of that production process, two or more actuation signal lines 4 and data signal lines 5 can be made into a touch-down condition, and the electrostatic discharge in each TFT2 can be prevented. Moreover, at the time of the inspection after manufacture, the short circuit and open circuit of the actuation signal line 4 or the data signal line 5 can be inspected by measuring the resistance between each drive wire side measurement pad 7 and the driving signal input pad 6 or between the data-line side measurement pad 9 and the data signal input pad 8.

[0005]

[Problem(s) to be Solved by the Invention] By the way, there are some which are proposed in JP,3-200121,A as an approach of inspecting conventionally the pixel in this kind of TFT mold LCD, i.e., the electric defect of the storage capacitance connected to TFT and this. It is inputting a data signal into the data signal line which impresses an electrical potential difference [like] and corresponds synchronizing with this. the actuation signal line to which TFT from which this approach serves as a subject of examination is connected -- TFT -- an ON state -- It is the approach store up a charge in the storage capacitance of Object TFT, read stored charge by setting an ON state as the object TFT again after going through a certain fixed time amount, and the output detects the defect of the target pixel.

[0006] However, since each actuation signal line 4 and the data signal line 5 are in the condition that package connection was made by the drive wire side highway 10 and the data-line side highway 11, respectively when it is going to adopt it as the conventional TFT mold LCD which described this inspection approach above When potential tends to be supplied to the target TFT through the actuation signal line 4 and you are going to make it turn this on, it becomes impossible for example, for this potential to make other actuation signal lines 4 turn on only a surroundings lump and the target TFT through the drive wire side highway 10. For this reason, the above mentioned inspection approach cannot be adopted as the conventional LCD, and the electric characteristic inspection of the TFT mold LCD cannot be conducted, but LCD in which a poor pixel exists will be overlooked.

[0007]

[Objects of the Invention] The object of this invention is to offer the TFT mold LCD which electric inspection is conducted and can find out the defect of a pixel. Moreover, other objects of this invention are to offer the approach of manufacturing such a TFT mold LCD.

[0008]

[Means for Solving the Problem] The TFT mold LCD of this invention is considered as the configuration which carried out electrical connection of two or more actuation signal lines connected to many pixel sections containing TFT and a pixel electrode to the drive wire side highway through resistance, respectively, and carried out electrical connection of two or more data signal lines to the data-line side highway through resistance, respectively.

[0009] For example, a driving signal input pad is formed in two or more actuation signal lines, respectively, a data signal input pad is formed in two or more data signal lines, respectively, and resistance is inserted, respectively between this driving signal input pad and a drive wire side highway and between a data signal input pad and a data-line side highway. Moreover, as for this resistance, it is desirable to form at some pixel ingredients which form a pixel electrode.

[0010] Moreover, manufacture of the TFT mold LCD of this invention is faced. The process which forms the flow section which connects a driving signal input pad, a drive wire side highway, and this driving signal input pad and a drive wire side highway with this actuation signal line at one at the same time it forms the gate electrode and actuation signal line of TFT, The process which forms an island between a driving signal input pad and a drive wire side highway in a part of the semi-conductor layer at the same time it forms the semi-conductor layer used as the channel of TFT, At the same time it forms the source drain electrode and data signal line of TFT The process which the connection section which

connects a drive wire side highway with a driving signal input pad in said island, respectively is formed [process], and a hole is simultaneously established [process] in said flow section, and makes the flow section intercept, It is characterized by including the process which forms said island into high resistance by ***** at the same time it forms a channel for said semi-conductor layer of TFT by *****, and the process which forms resistance with said pixel electrode material between said driving signal input pad and a drive wire side highway at the same time it forms a pixel electrode.

[0011] Furthermore, the process which forms an island in said a part of semi-conductor layer between the data signal input pad formed at degree process, and a data-line side highway at the same time it forms the semi-conductor layer of TFT, At the same time it forms the source drain electrode and data signal line of TFT The process which forms in this data signal line and one a data signal input pad, a data-line side highway, and the connection section that connects a data-line side highway with said data signal input pad in said island, respectively, It is desirable to include the process which forms said island into high resistance by ***** at the same time it forms a channel for the semi-conductor layer of TFT by *****, and the process which forms resistance with said pixel electrode material between said data signal input pad and a data-line side highway at the same time it forms a pixel electrode.

[0012]

[Function] By inserting resistance between two or more actuation signal lines and a drive wire side highway and between a data signal line and a data-line side highway While it is possible to carry out electrical connection of each signal line to each highway, and to prevent electrification of static electricity in each signal line The voltage drop of the potential impressed to each actuation signal line or a data signal line is carried out by resistance, turning to other signal lines is prevented and it becomes possible [maintaining an independent condition to each TFT and inspecting each electrical property].

[0013] Moreover, after securing the electrical connection of an actuation signal line and a drive wire side highway by the flow section formed in this and one after forming an actuation signal line and forming a data signal line Since the electrical connection of each signal line of an actuation signal line and a data signal line and each highway is secured in the island formed in this, the connection section formed in one, and a part of semi-conductor layer and final resistance is formed in formation and coincidence of a pixel electrode The condition of having always carried out electrical connection of each signal line to the highway can be held between the production processes of LCD, and it can prevent the destruction of TFT by the electrification charge in the middle of a production process.

[0014]

[Example] Next, the example of this invention is explained with reference to a drawing. Drawing 1 is circuitry drawing of one example of this invention. The pixel section 1 consists of TFT2 and a pixel electrode 3 containing storage capacitance, and array formation of many pixel sections 1 is carried out at the shape of a matrix. And two or more actuation signal lines 4 are connected to a line writing direction at each gate of TFT2, and two or more data signal lines 5 are connected to each drain of TFT2 in the direction of a train. The driving signal input pad 6 is formed in each end section, and, as for said actuation signal line 4, the drive wire side measurement pad 7 is formed in the other end. Similarly, the data signal input pad 8 is formed in each end section, and, as for said data signal line 5, the data-line side measurement pad 9 is formed in the other end.

[0015] And although the driving signal input pad 6 of each of said actuation signal line 4 is connected to the drive wire side highway 10, respectively, resistance 12 is inserted here between each driving signal input pad 6 and the drive wire side highway 10. Although the data signal input pad 8 of each of said data signal line 5 is similarly connected to the data-line side highway 11, respectively, resistance 13 is inserted between each data signal input pad 8 and the data-line side highway 11. Although these resistance 12 and 13 can be set up as resistance of arbitration, when it considers that the whole electric discharge effectiveness mentions later, the resistance of several Kohms to 100Komega is desirable. Moreover, the drive wire side package pad 14 connects with said drive wire side highway 10, it is formed, and the data-line side package pad 15 is similarly connected and formed in said data-line side

highway 11.

[0016] Thus, by inserting resistance 12 between the driving signal input pad 6 and the drive wire side highway 10 By carrying out electrical connection of two or more actuation signal lines 4 to the drive wire side highway 10 altogether, and holding the drive wire side highway 10 of a parenthesis to predetermined potential in the drive wire side package pad 14 In the production process of LCD, static electricity is not charged in each actuation signal line 4, and each TFT2 can be prevented from an electrostatic discharge. Similarly, by inserting resistance 13 between the data signal input pad 8 and the data-line side highway 11, electrical connection of two or more data signal lines 5 is altogether carried out to the data-line side highway 11, and the destruction of TFT2 by electrification of static electricity can be prevented by holding the data-line side highway 11 of a parenthesis to predetermined potential in the data-line side package pad 15.

[0017] On the other hand, by energizing by contacting a measurement needle between the driving signal input pad 6 prepared in each actuation signal line 4 in the inspection at the time of manufacturing LCD, and the drive wire side measurement pad 7, resistance of the actuation signal line 4 can be measured; and the short circuit, open circuit, etc. can be inspected. This can be similarly inspected in the data signal line 5 by using the data signal input pad 8 and the data-line side measurement pad 9.

[0018] Furthermore, impress predetermined potential to the actuation signal line 4 which contains TFT2 as a subject of examination in case each pixel section 1 is inspected, and the TFT2 is made into an ON state. And data can be made to be able to hold in this pixel section 1 of TFT2 in inputting a data signal into the data signal line 5 containing this TFT2, and the electric characteristic inspection of that pixel section 1 can be conducted by making that TFT2 turn on again and reading data after predetermined time. Although the actuation signal line 4 with which the pixel section 1 to be examined is contained is connected electrically [other actuation signal lines 4] at this time Since the resistance 12 connected to each among both will be inserted in a two-piece serial condition, Since the voltage drop of the potential impressed with the high resistance is carried out, it turns even to other actuation signal lines, and the electric characteristic inspection which carries out ON actuation of TFT2 of other pixel sections 1 and starts can be carried out suitably.

[0019] Drawing 2 is the top view of the wiring field which constitutes the resistance 12 inserted between said driving signal input pads 6 and drive wire highways 10, and drawing 3 is the sectional view of the field containing TFT2 and the pixel electrode 3. The formation approach of resistance 12 is explained with reference to these drawings. For example, on a glass substrate 21, the 1st chromium film is formed in a necessary pattern, and the gate electrode 22 and the actuation signal line 4 of this and one are formed. While said driving signal input pad 6 is formed in the end section of the actuation signal line 4 at one at this time, the flow section 23 and the drive wire side highway 10 are further formed in one succeeding this driving signal input pad 6. Thereby, the actuation signal line 4 is made into the condition that electrical connection was carried out to the drive wire side highway 10 through the flow section 23. Moreover, although the drive wire side measurement pad 7 is formed in the other end of the actuation signal line 4 as described above, a graphic display is omitted here.

[0020] Subsequently, although gate dielectric film 24 is formed and the n⁺-amorphous silicon 25 is formed on it at a necessary pattern, in that case, said flow section 23 is adjoined and an island 26 is formed in the mid-position between said driving signal input pad 6 and the drive wire side highway 10 at some n⁺-amorphous silicon 25. and although the 2nd chromium film is formed in a necessary pattern and each electrode 27 of a source drain is formed on said n⁺-amorphous silicon 25, the connection section 28 is formed so that the drive wire side highway 10 may resemble said driving signal input pad 6, respectively and it may lap at a part of this, simultaneously this 2nd chromium film. These connection sections 28 have put that point on said island 26, therefore through this island 26, electrical connection of each connection section 28 will be carried out mutually, and, as a result, the driving signal input pad 6 will be in the condition that electrical connection was carried out to the drive wire side highway 10. Moreover, a hole 29 is established in the flow section 23 which consists of said 1st chromium film, and

formation and coincidence of this connection section 28 are made to intercept the flow section 23 by that staging area.

[0021] Subsequently, although a ditch lump is performed that a channel should be formed to said n+-amorphous silicon 25, a ditch lump of a part while each edge of the connection section 28 confronts each other also to an island 26 at this time is performed, and an island 26 is made into a high resistance condition. Thereby, the driving signal input pad 6 and the drive wire side highway 10 will be in the condition that electrical connection was carried out by high resistance of an island 26.

[0022] Then, although an interlayer insulation film 30 is formed, and ITO (indium tin oxide) is formed in a necessary pattern and the pixel electrode 3 is formed, a part of this ITO is formed so that it may lap on said driving signal input pad 6 and the drive wire side highway 10, and the necessary resistance pattern 31 to which these are connected further is formed. Here, the resistance pattern 31 of necessary resistance has been obtained by forming a part of ITO in the square wave mold of a narrow width. Therefore, the resistance 12 shown in drawing 1 is constituted as resistance which carried out parallel connection of the resistance by said island 26, and the resistance by this resistance pattern 31 of ITO. However, since the resistance formed in said island 26 is high resistance, the resistance of the resistance pattern 31 by this ITO will function as resistance 12 of drawing 1 almost as it is.

[0023] Therefore, it sets by forming resistance 12 in this way to the production process which forms TFT and LCD. After forming the actuation signal line 4, the condition that electrical connection of each actuation signal line 4 was carried out to the drive wire side highway 10 by the flow section 23 until it formed the data signal line 5 is held. The condition that electrical connection of each actuation signal line 4 was carried out to the drive wire side highway 10 by an island 26 and the connection section 28 until it formed resistance 12 by ITO after forming the data signal line 5 is held. Therefore, between this production process, since the condition that electrical connection of each actuation signal line 4 was always carried out to the drive wire side highway 10 is held, the destruction of TFT by electrification of static electricity is prevented.

[0024] In addition, since the flow section 23 formed at some actuation signal lines 4 is disconnected by the hole 29 after that and an island 26 and the connection section 28 are formed into high resistance by ditch lump of an island 26, the resistance pattern 31 eventually formed of ITO will be formed as substantial resistance 12.

[0025] Moreover, although a graphic display is omitted If the same is said of the resistance 13 formed in each data signal line 5 and drawing 2 is referred to in this case An island 26 is formed with the n+-amorphous silicon 25. By subsequently, the thing for which the connection section 28 by the 2nd chromium film is formed, a ditch lump of an island 26 is performed after that, and the process which forms the resistance pattern 31 of predetermined resistance by ITO further is performed The condition of having carried out electrical connection of each data signal line 5 to the data-line side highway 11 in the production process like the case of the actuation signal line 4 can be held.

[0026]

[Effect of the Invention] Since this invention is carrying out electrical connection of two or more actuation signal lines connected to many pixel sections containing TFT and a pixel electrode, and data signal lines to each highway through resistance, respectively as explained above While making it possible to hold the electrical connection condition of each signal line and each highway, and to prevent electrification of static electricity in each signal line Since the voltage drop of the potential impressed to each actuation signal line or a data signal line is carried out by resistance, It is prevented that this potential turns to other signal lines, it becomes possible [maintaining an independent condition for each TFT and inspecting each electrical property], and becomes possible [detecting the defect of each pixel section and obtaining reliable LCD].

[0027] In this case, since the signal input pad is formed in each signal line, respectively and resistance is inserted between this signal input pad and each highway, respectively, it does not become a failure at the time of this resistance measuring resistance in each signal line, and the short circuit and open

circuit in each signal line can be inspected to accuracy.

[0028] Moreover, manufacture of the TFT mold LCD of this invention is faced. By forming the flow section which connects a driving signal input pad, a drive wire side highway, and this driving signal input pad and a drive wire side highway with an actuation signal line at one It is maintaining the condition of having carried out electrical connection of the actuation signal line to the highway by this flow section henceforth, and forming an island after that in a part of semi-conductor layer, and forming the connection section in a data signal line and coincidence. The condition of having carried out electrical connection of the signal line to the highway in an island and the connection section can be maintained, and the static electricity destruction in the middle of a production process can be prevented until final resistance is formed with a pixel electrode material henceforth.

[0029] Moreover, since the flow section is disconnected by the hole in this case and an island is formed into high resistance by ditch lump, the resistance of the resistance eventually formed with a pixel electrode material is hardly affected, and it can obtain resistance of desired resistance.

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] It is circuitry drawing of one example of the TFT mold LCD of this invention.

[Drawing 2] It is the top view of the important section of this invention.

[Drawing 3] It is the sectional view of the pixel field in this invention.

[Drawing 4] It is circuitry drawing of an example of the conventional TFT mold LCD.

[Description of Notations]

1 Pixel Section

2 TFT

3 Pixel Electrode

4 Actuation Signal Line

5 Data Signal Line

6 Driving Signal Input Pad

8 Data Signal Input Pad

10 Drive Wire Side Highway

11 Data-Line Side Highway

12 13 Resistance

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